AMENDMENT

This listing of claims will replace all prior versions and listings of claims in the application.

1. (Original) A method for the preparation of nanoparticle conjugates comprising:

a) providing a first reagent comprising a flexible hydrophilic polymer;

b) providing a second reagent comprising at least one functional molecule capable of being substituted into the flexible hydrophilic polymer;

c) providing a third reagent comprising ~~if~~ nanoparticles;

d) contacting the first reagent with the second reagent for a period of time and under conditions effective to allow substitution of the at least one functional molecule into the flexible hydrophilic polymer;

e) before, during and/or after step d) providing the flexible hydrophilic polymer with a plurality of substituents capable, optionally after deprotection, of binding to the nanoparticles to provide an intermediate product comprising the flexible hydrophilic polymer substituted with the at least one functional molecule and a plurality of substituents capable, optionally after deprotection, of binding to the nanoparticles;

f) if necessary, deprotecting the plurality of substituents capable of binding to the nanoparticles; and

g) contacting the, if necessary deprotected, intermediate product of step e) with the third reagent for a period of time and under conditions effective to allow binding of the, if necessary deprotected, intermediate product with the nanoparticles to provide the nanoparticle conjugates wherein the number of functional molecules conjugated per nanoparticle in the final step is controlled by at least one of:

- controlling, by means of suitable selection of reagents and reaction conditions, the number of functional molecules substituted into the flexible hydrophilic polymer in step d);
- controlling, by means of suitable selection of reagents and reaction conditions, the number of optionally protected substituents capable of binding to the nanoparticles substituted into the flexible hydrophilic polymer in step e); and
- controlling, by means of suitable selection of reagents and reaction conditions, the number of intermediate product molecules binding to the nanoparticles in step g).

2. (Original) A method according to claim 1 wherein control of the number of functional molecules per nanoparticle is achieved by at least one of:

- selecting the relative sizes of the flexible hydrophilic polymer and the nanoparticle to control the number of molecules of flexible hydrophilic polymer, and therefore of optionally deprotected intermediate products, which can be accommodated on the surface of the nanoparticle;
- selecting the relative concentrations of the first and second reagents in step d) to control the number of functional molecule (s) substituted into each molecule of flexible hydrophilic polymer; and
- selecting the number per molecule of flexible hydrophilic polymer of substituent molecules capable, optionally after deprotection, of binding to the nanoparticles.

3. (Previously Presented) A method according to claim 1 further comprising determining at least approximately the desired number of, if necessary deprotected, intermediate product molecules to be bound to each nanoparticle in step g) and selecting the relative size of the flexible hydrophilic polymer and the nanoparticle such that the number of, if necessary deprotected, intermediate product molecules which can be accommodated on the surface of each nanoparticle at least approximately matches the desired number.

4. (Previously Presented) A method according to claim 1 further comprising determining at least approximately the desired number of functional molecule (s) to be substituted into each molecule of flexible hydrophilic polymer in step d) and selecting accordingly the reagent concentrations and reaction conditions in step d).

5. (Previously Presented) A method according to claim 1 further comprising determining at least approximately the desired number of substituent molecules capable, optionally after deprotection, of binding to the nanoparticles to be substituted into each molecule of flexible hydrophilic polymer in step e) and selecting accordingly the reagent concentrations and reaction conditions in step e).

6. (Previously Presented) A method according to claim 1 wherein the relative size of the flexible hydrophilic polymer and the nanoparticle are selected to be effective to allow binding in step g) of a controlled number of the, if necessary deprotected, intermediate product molecules with the nanoparticles.

7. (Original) A method for the preparation of a nanoparticle conjugates comprising:

i) providing a first reagent comprising a flexible hydrophilic polymer having a plurality of substituents capable, optionally after deprotection, of binding to a nanoparticle;

ii) providing a second reagent comprising one or more functional molecules suitable for binding to target molecules, optionally in a biomolecular assay, and capable of being substituted into the flexible hydrophilic polymer;

iii) providing a third reagent comprising nanoparticles capable of binding to the plurality of substituents of the flexible hydrophilic polymer;

iv) contacting the first reagent with the second reagent for a period of time and under conditions effective to allow the substitution of the at least one functional molecule into the flexible hydrophilic polymer and provide an intermediate product comprising the flexible hydrophilic polymer substituted with the at least one functional molecule; and

v) contacting the intermediate product of step iv) with the third reagent for a period of time and under conditions effective to allow binding of the intermediate product with the nanoparticles to provide the nanoparticle conjugate.

8. (Currently Amended) A method according to claim ~~1~~ 7 wherein the number of functional molecules substituted into the flexible hydrophilic polymer in the intermediate product is determined before the step of contacting the intermediate product with the third reagent.

9. (Currently Amended) A method according to claim ~~1~~ 7 wherein the number of functional molecules per molecule of the flexible hydrophilic polymer in the intermediate product is determined before the step of contacting the intermediate product with the third reagent.

10. (Currently Amended) A method according to claim ~~1~~ 7 further comprising the step of determining the number of intermediate product molecules bound to the nanoparticles in the nanoparticle conjugates.

11. (Currently Amended) A method according to claim ~~1~~ 7 further comprising the step of determining the number of intermediate product molecules bound per nanoparticle in the nanoparticle conjugates.

12. (Currently Amended) A method according to claim ~~1~~ 7 further comprising the step of determining at least approximately the average size of the nanoparticles and selecting the hydrophilic flexible polymer to be of an overall size (considering at least one or more of molecular weight, chain length and degree of chain branching) such that the nanoparticle conjugate is able to accommodate a mean number z of flexible hydrophilic polymer molecules around its surface.

13. (Original) A method according to claim 12 wherein z is selected according to the intended application of the nanoparticle conjugate.

14. (Original) A method for producing a nanoparticle conjugate comprising:

I) providing a nanoparticle having a surface area x;

II) providing a flexible hydrophilic polymer having a chain length and degree of branching such that a molecule of the polymer has the capacity, when suitably conformed, to envelop a surface area x/y;

III) substituting the polymer with a plurality of conjugation substituents capable of binding to the nanoparticle and with at least one functional molecule capable of imparting a function in a biomolecular assay or other application to the nanoparticle conjugate; and

IV) conjugating approximately y molecules of the polymer to the nanoparticle via the said plurality of conjugation substituents;

wherein the flexible hydrophilic polymer is selected with regard to the variable y to provide a nanoparticle conjugate having an at least approximately predetermined number of flexible hydrophilic polymer molecules per nanoparticle.

15. (Currently Amended/Withdrawn) A nanoparticle conjugate obtained by a method according to claim 1<u>4</u>.

16. (Currently Amended/Withdrawn) A nanoparticle conjugate derivable from a method according to claim 1<u>4</u> which comprises, on average, a single molecule of intermediate product conjugated to each nanoparticle.

17. (Currently Amended/Withdrawn) A nanoparticle conjugate derivable from a method according to claim 14 wherein the nanoparticles are metallic and are produced from Au, Ag, Cu, Pd or composites thereof.

18. (Currently Amended/Withdrawn) A nanoparticle conjugate derivable from a method according to claim 14 wherein the nanoparticles are semiconductors.

19. (Withdrawn) A nanoparticle conjugate as claimed in claim 18, wherein the nanoparticles are core-shell quantum dots comprising a core having a selected band gap energy and a shell having a greater band gap energy than the core.

20. (Withdrawn) A semiconductor nanoparticle conjugate as in claim 19, wherein the core of the quantum dot has the formula YX, where Y is selected from Zn, Cd, Hg and combinations thereof, and X is selected from S, Se, Te and combinations thereof, and the shell of the quantum dots has the formula AB, where A is selected from Zn, Cd and mixtures thereof, and B is selected from S, Se, Te and mixtures thereof, such that AB is not identical to YX and wherein AB has a higher band gap energy than the core of the quantum dot.

21. (Currently Amended/Withdrawn) A nanoparticle conjugate derivable from a method according to claim 14, comprising a nanoparticle conjugated to a flexible hydrophilic polymer having at least one functional molecule thereon, the conjugation being provided by multiple mercapto groups.

22. (Withdrawn) A nanoparticle conjugate comprising a nanoparticle conjugated to a functionalized flexible hydrophilic polymer via a plurality of mercapto groups.

23. (New) A method according to claim 1, wherein the number of functional molecules substituted into the flexible hydrophilic polymer in the intermediate product is determined before the step of contacting the intermediate product with the third reagent.

24. (New) A method according to claim 1, wherein the number of functional molecules per molecule of the flexible hydrophilic polymer in the intermediate product is determined before the step of contacting the intermediate product with the third reagent.

25. (New) A method according to claim 1, further comprising the step of determining the number of intermediate product molecules bound to the nanoparticles in the nanoparticle conjugates.

26. (New) A method according to claim 1, further comprising the step of determining the number of intermediate product molecules bound per nanoparticle in the nanoparticle conjugates.

27. (New) A method according to claim 1, further comprising the step of determining at least approximately the average size of the nanoparticles and selecting the hydrophilic flexible polymer to be of an overall size (considering at least one or more of molecular weight, chain length and degree of chain branching) such that the nanoparticle conjugate is able to accommodate a mean number z of flexible hydrophilic polymer molecules around its surface.

28. (New) A method according to claim 27, wherein z is selected according to the intended application of the nanoparticle conjugate.

29. (New) A nanoparticle conjugate obtained by a method according to claim 1.

30. (New) A nanoparticle conjugate derivable from a method according to claim 1 which comprises, on average, a single molecule of intermediate product conjugated to each nanoparticle.

31. (New) A nanoparticle conjugate derivable from a method according to claim 1 wherein the nanoparticles are metallic and are produced from Au, Ag, Cu, Pd or composites thereof.

32. (New) A nanoparticle conjugate derivable from a method according to claim 1 wherein the nanoparticles are semiconductors.

33. (New) A nanoparticle conjugate as claimed in claim 32, wherein the nanoparticles are core-shell quantum dots comprising a core having a selected band gap energy and a shell having a greater band gap energy than the core.

34. (New) A semiconductor nanoparticle conjugate as claimed in claim 33, wherein the core of the quantum dot has the formula YX, where Y is selected from Zn, Cd, Hg and combinations thereof, and X is selected from S, Se, Te and combinations thereof, and the shell of the quantum dots has the formula AB, where A is selected from Zn, Cd and mixtures thereof, and B is selected from S, Se, Te and mixtures thereof, such that AB is not identical to YX and wherein AB has a higher band gap energy than the core of the quantum dot.

35. (New) A nanoparticle conjugate derivable from a method according to claim 1, comprising a nanoparticle conjugated to a flexible hydrophilic polymer having at least one functional molecule thereon, the conjugation being provided by multiple mercapto groups.

36. (New) A nanoparticle conjugate obtained by a method according to claim 7.

37. (New) A nanoparticle conjugate derivable from a method according to claim 7 which comprises, on average, a single molecule of intermediate product conjugated to each nanoparticle.

38. (New) A nanoparticle conjugate derivable from a method according to claim 7 wherein the nanoparticles are metallic and are produced from Au, Ag, Cu, Pd or composites thereof.

39. (New) A nanoparticle conjugate derivable from a method according to claim 7 wherein the nanoparticles are semiconductors.

40. (New) A nanoparticle conjugate as claimed in claim 39, wherein the nanoparticles are core-shell quantum dots comprising a core having a selected band gap energy and a shell having a greater band gap energy than the core.

41. (New) A semiconductor nanoparticle conjugate as claimed in claim 40, wherein the core of the quantum dot has the formula YX, where Y is selected from Zn, Cd, Hg and combinations thereof, and X is selected from S, Se, Te and combinations thereof, and the shell of the quantum dots has the formula AB, where A is selected from Zn, Cd and mixtures thereof, and B is selected from S, Se, Te and mixtures thereof, such that AB is not identical to YX and wherein AB has a higher band gap energy than the core of the quantum dot.

42. (New) A nanoparticle conjugate derivable from a method according to claim 7, comprising a nanoparticle conjugated to a flexible hydrophilic polymer having at least one functional molecule thereon, the conjugation being provided by multiple mercapto groups.